Energy recap
Momentum intro
Homework:
eg. 1. A 100W light bulb on for 8.0 hours a day for a year cost how much to run? If you use an LED bulb that uses 25W for the same brightness, how much do you save/year?

1. An electric motor that is 80.0% efficient pulls a 5.0kg block with coefficient of friction, 0.30, at 4.0 m/s. How much electrical power is used?

p145-146
Q19, 25, 33, 41, 47 (hp = 746W), 53, 56

1. 100x8x365.25=292,200 = 292 kWhrs/year
   0.12x292=35.04 $35/year
   35.04/4=8.76 $8.76/year
   how much do you save/year? 35.04-8.76=26.28 about $26.
   How does it work?
   incandescent light bulbs produce electromagnetic by having vibrating electrons - changing electric field produces a changing magnetic field that produces a changeing electric field ad infinitum

   LED's - Light emitting diodes
   HL topic - dope (add a chemical) semiconductor,

like silicon, it can be electron attracting or repelling. By putting two doped semiconductors together, it creates a voltage barrier. As the electrons jump the barrier, they emit light of a specific frequency - energy.

$E=hf$

Incandescent - light of random frequencies include lots of heat.
LED - light of specific frequencies include little heat lost.

2. An electric motor that is 80.0% efficient pulls a 5.0kg block with coefficient of friction, 0.30, at 4.0 m/s. How much electrical power is used?

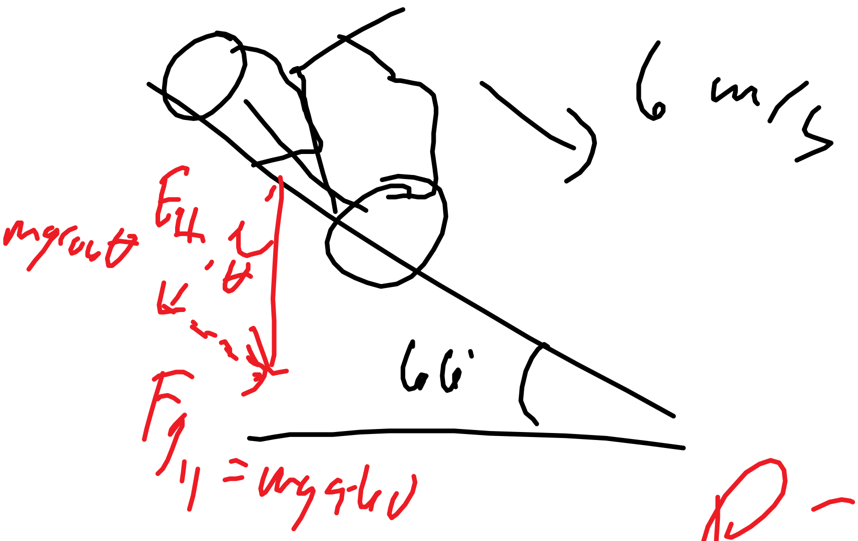
$P=W/t = Fs/t = Fv = \mu mgv = 0.3x5x9.8x4=58.8$ W
eff = pout/pin x 100%
pin = pout/eff = 58.8/0.8=73.5 W of electrical energy

the 20% loss is heat in the motor
not friction of the block - that is where the 80% goes

p146 Q56

$m = 75kg$

$F_{away} = mg\sin\theta$



$F_{net} = F_{drag} + F_{g\parallel}$

$F_{net} = 2mg\sin\theta$

$P = Fv$

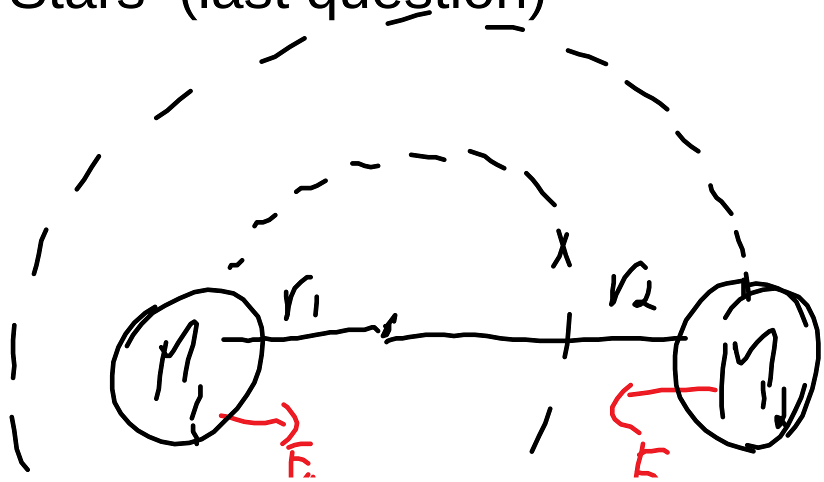
$= 2(75)(9.8)\sin(6.6) \times 6$

2x75x9.8xSin(6.6)x6=
1,013.745667347083
1,013.745667347083/746=
1.35890840127
1.1 kW = 1.4 Hp

Fdrag = cv c is a constant for laminar fluid flow

Short answer on test

Binary Stars (last question)



T

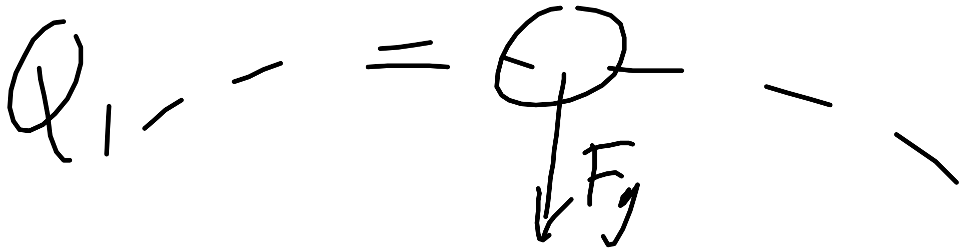
$$\frac{M_1 4\pi^2 r_1}{T^2} = \frac{M_2 4\pi^2 r_2}{T^2}$$

$$M_1 r_1 = M_2 r_2$$

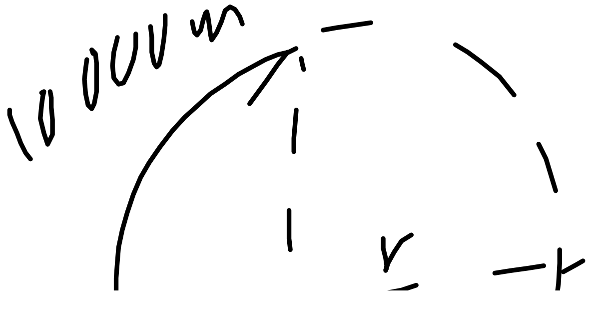
$ma_c = mg$

$$F_g = \frac{GM_1M_2}{(r_1+r_2)^2}$$ ⇐ same for both

F_g is only Force
So F_c must be the same



Force of gravity due to the Earth's mass



$C = 40\,000\ m$

$C = 2\pi r$

C = 2πr

r = 6000m

c) a = 10m/s 0.5 mark

a few hundred is small relative to 6000

0.5 mark - working to 1sf

d)

the force increases with mass but the inertia also increases, so the acceleration = F/m = mg/m = g is independent of the mass.

$g = GM/r^2$ is independent of m - sure

Satellite speed - a $=v^2/r$
v= Sqrt(10 x6000 000)

Sqrt(60)=7.745966692414833
Sqrt(1000000)=1000
7.7 km/s 8 km/s or 7km/s to 1sf

T = D/v = 40000000/7700=5194.8052

5194.8052/60=86.5801 87 minutes